

What is claimed is:

1. A self-sustained pulsating laser diode which having a double-heterostructure minimally comprising:
a cladding layer of a first conductivity type;
5 a multi-quantum well active layer; and
a cladding layer of a second conductivity type each being arranged on a semiconductor substrate of the first conductivity type, wherein the number of said quantum wells being at least 5 and no greater than 10; and
10 said layer thickness of a flat part of said cladding layer having a current blocking structure is at least 300nm and no greater than 500nm;
and further wherein a carrier density in said flat part of the cladding layer having a current blocking structure is at
15 least $1 \times 10^{17} \text{cm}^{-3}$ and no greater than $5 \times 10^{17} \text{cm}^{-3}$.
2. A self-sustained pulsating laser diode which having a double-heterostructure minimally comprising:
a cladding layer of a first conductivity type;
a multi-quantum well active layer; and
20 a cladding layer of a second conductivity type each being arranged on a semiconductor substrate of the first conductivity type, wherein an effective refractive index difference parallel to the layer is at least 7×10^{-4} and no greater than 3×10^{-3} , and further wherein a carrier density in
25 a flat part of said cladding layer having a current blocking structure is at least $1 \times 10^{17} \text{cm}^{-3}$ and no greater than $5 \times 10^{17} \text{cm}^{-3}$.
3. A self-sustained pulsating laser diode according to claim 1, wherein said cladding layer is made of a semiconductor that includes AlGaInP, and the said active

layer is a semiconductor that includes either or both GaInP and AlGaInP.

4. A self-sustained pulsating laser diode according to claim 2, wherein said cladding layer is made of a semiconductor that includes AlGaInP, and the said active layer is a semiconductor that includes either or both GaInP and AlGaInP.

5. A self-sustained pulsating laser diode according to claim 1, wherein the (001) plane of said semiconductor substrate is misoriented by 5 degrees or more toward the [110] direction, and wherein said multi-quantum well active layer consists of compressively strained quantum wells.

6. A self-sustained pulsating laser diode according to claim 2, wherein the (001) plane of said semiconductor substrate is misoriented by 5 degrees or more toward the [110] direction, and wherein said multi-quantum well active layer consists of compressively strained quantum wells.

7. A self-sustained pulsating laser diode according to claim 3, wherein the (001) plane of said semiconductor substrate is misoriented by 5 degrees or more toward the [110] direction, and wherein said multi-quantum well active layer consists of compressively strained quantum wells.

8. A self-sustained pulsating laser diode according to claim 4, wherein the (001) plane of said semiconductor substrate is misoriented by 5 degrees or more toward the [110] direction, and wherein said multi-quantum well active layer consists of compressively strained quantum wells.

9. A self-sustained pulsating laser diode which having a double-heterostructure minimally comprising:

a cladding layer of a first conductivity type;
a multi-quantum well active layer; and
a cladding layer of a second conductivity type each being
arranged on a semiconductor substrate of the first
5 conductivity type, wherein the number of said quantum wells
being at least 5; and
said layer thickness of a flat part of said cladding layer
having a current blocking structure is at least 300nm;
and further wherein an effective refractive index difference
10 parallel to the layer (Δn) is at least 7×10^{-4} and no greater
than 3×10^{-3} .

10. A self-sustained pulsating laser diode according to
claim 9, said effective refractive index difference parallel
to the layer (Δn) is around 1×10^{-3} .

15 11. A self-sustained pulsating laser diode according to
claim 1, wherein said carrier density in said flat part of
the cladding layer having a current blocking structure is less
than $3 \times 10^{17} \text{cm}^{-3}$.

20 12. A self-sustained pulsating laser diode according to
claim 2, wherein said carrier density in said flat part of
the cladding layer having a current blocking structure is less
than $3 \times 10^{17} \text{cm}^{-3}$.